IN THE CLAIMS

Claims 1-12 (canceled).

13. (previously presented)The method of claim 93, wherein the combustion system includes an air preheater.

14. (previously presented)The method of claim 93, wherein the gas phase pollutants include sulfur trioxide.

15. (original) The method of claim 14, wherein the temperature gradients within the air preheater are modified to increase the rate of sulfur trioxide condensation on ash particles as they pass through the air preheater and continue to travel downstream.

16. (previously presented)The method of claim 93, further comprising taking into account the fuel type used in the combustion system.

17. (previously presented)The method of claim 93, further comprising taking into account the geometry of the combustion system.

18. (previously presented)The method of claim 93, wherein the optimal locations are determined based on where pollutant condensation occurs in the combustion system.

19. (previously presented)The method of claim 93, further comprising determining rates of reaction of components.

Claims 20-59 (canceled).

60. (previously presented)The method of claim 94, wherein the gas phase pollutants include sulfur trioxide.

61. (previously presented)The method of claim 60, wherein the temperature gradients within the air preheater are modified to increase the rate of sulfur trioxide condensation on ash particles as they pass through the air preheater and continue to travel downstream.

62. (previously presented)The method of claim 94, wherein various parameters of the combustion system are modeled.

63. (previously presented)The method of claim 62, wherein the parameters include particle formation, temperature patterns, rates of reaction of components, and condensation reactions of pollutants.

Claim 64 (canceled)

65. (previously presented)The method of claim 62, wherein the parameters include the geometry of the combustion system.

Claim 66 (canceled)

67. (previously presented)The method of claim 95, wherein the location of the injection are determined based on where pollutant condensation occurs in the combustion system.

68. (previously presented)The method of claim 95, wherein the chosen location of the injection are determined by measuring gas phase pollutant capture at various injection locations.

69. (previously presented)The method of claim 95, wherein the gas phase pollutants include sulfur trioxide.

70. (previously presented)The method of claim 69, wherein the temperature gradients within the air preheater are modified to increase the rate of sulfur trioxide condensation on ash particles as they pass through the air preheater and continue to travel downstream.

71. (previously presented)The method of claim 95, further comprising modeling various parameters of the combustion system.

72. (previously presented)The method of claim 71, wherein the parameters include temperature patterns, rates of reaction of components, and condensation reactions of pollutants.

Claim 73 (canceled)

74. (previously presented)The method of claim 72, wherein the parameters include the geometry of the combustion system.

75. (previously presented)The method of claim 71, further comprising using the modeled parameters to determine optimal concentration and size of the particles to be injected.

76. (previously presented)The method of claim 95, wherein the gas phase pollutants captured in the combustion system include at least one member selected from the group consisting of sulfur trioxide, mercury, and other volatile elements , inorganic and organic compounds.

Claim 77 (canceled)

78. (previously presented)The method of claim 96, wherein the critical phenomena are enabled by providing zones in the combustion system with a temperature gradient chosen such that a temperature shift occurs from above the dew point of a particular gas phase pollutant to below its dew point and with sufficient nucleation sites present for the condensation reaction of the particular gas phase pollutant to occur.

79. (previously presented)The method of claim 78, wherein the size distribution of the injected particles is chosen such that the injected particles provide sufficient nucleation sites for the condensation reaction to occur, and can be captured in a subsequent particulate control system in the combustion system.

80. (previously presented)The method of claim 96, wherein the gas phase pollutants include sulfur trioxide.

81. (previously presented)The method of claim 96, wherein the material of the injected particles is chosen such that it neutralizes the acidity of the sulfur trioxide.

82. (previously presented)The method of claim 81, wherein the material of the injected particles is selected from the group consisting of fly ash, finely ground minerals, alkali compounds, alkaline-earth compounds, aerosols, and aqueous solutions of salts and mists.

83. (previously presented)The method of claim 96, wherein the temperature gradient is achieved by an air preheater that is modified or operated to increase the rate of sulfur trioxide condensation on ash particles as they pass through the air preheater and continue to travel downstream.

84. (previously presented)The method of claim 96, further comprising determining optimal concentration and size of the particles to be injected.

85. (currently amended) The method of claim 96, wherein the ~~optimal~~ locations are determined such that pollutant condensation occurs primarily on the injected particles.

86. (previously presented)The method of claim 96, wherein the gas phase pollutants captured in the combustion system include at least one member selected from the group consisting of sulfur trioxide, mercury, and other volatile elements , inorganic and organic compounds.

87. (previously presented)The method of claim 96, further comprising modeling various parameters of the combustion system.

88. (previously presented)The method of claim 87, wherein the parameters include temperature patterns, rates of reaction of components, and condensation reactions.

89. (previously presented)The method of claim 88, wherein the parameters include the geometry of the combustion system.

90. (previously presented)The method of claim 96, wherein the combustion system includes a furnace.

Claim 91 (canceled)

92. (currently amended) The method of claim 94, wherein ~~the~~ an air preheater is ~~operated~~ used to modify the temperature of ~~the~~ flue gas traveling through the air preheater and downstream ductwork.

93. (previously presented)A method of capturing gas phase pollutants in a combustion system comprising the steps of:

modeling flow patterns of the combustion system;

modeling temperature patterns of the combustion system;

modeling condensation reactions of the combustion system;

using the modeled flow patterns, temperature patterns, and modeled condensation reactions to predict the impact on gas phase pollutants from injecting particles into the combustion system, and to predict the impact on gas phase pollutants by the particle size distribution and the amount of injected particles in order to reduce the pollutants to a desired level;

using the modeled flow patterns, modeled temperature patterns, and modeled condensation reactions to determine one or more optimal locations in the combustion system for the injection of particles;

using the modeled flow patterns, modeled temperature patterns, and modeled condensation reactions to determine an optimal size and amount of particles to be injected; and

injecting the determined amount and size of particles into the combustion system at one or more of the determined locations to capture gas phase pollutants in the combustion system.

94. (currently amended) A method of capturing gas phase pollutants in a combustion system downstream of a combustion zone comprising:

predicting the temperature gradient and location in the combustion system where the critical phenomena of condensation of gas phase pollutants occur; ~~and~~

using the predicted temperature gradient and location to predict the effect of modifications to the combustion system, wherein the size distribution of resultant ash particles in the combustion system has an increased population of fine particles below 5 microns compared to the combustion system without the modifications<u>; and</u>

<u>injecting particles into the combustion system at one or more locations</u>.

95. (currently amended) A method of capturing gas phase pollutants in a combustion system comprising:

predicting the temperature gradient and location in the combustion system where the critical phenomena of condensation of gas phase pollutants occur;

using the predicted temperature gradient and location to configure the combustion system, including determining optimal distribution of particles and particle injection locations in the combustion system to enhance the heterogeneous condensation of gas phase pollutants onto ~~the~~ injected particles; and

injecting particles into the combustion system at one or more locations, wherein the size of the particles and the location of the injection are chosen such that pollutant condensation occurs primarily on the injected particles.

96. (currently amended) A method of capturing gas phase pollutants in a combustion system downstream of a combustion zone comprising the steps of:

predicting the temperature gradient and location in the combustion system where the critical phenomena of condensation of the gas phase pollutants occur;

using the predicted temperature gradient and location to determine optimal size distribution of particles and locations to inject particles into the combustion system to enhance heterogeneous condensation of gas phase pollutants onto ~~the~~ injected particles; and

injecting particles into the combustion system at one or more of the determined locations.